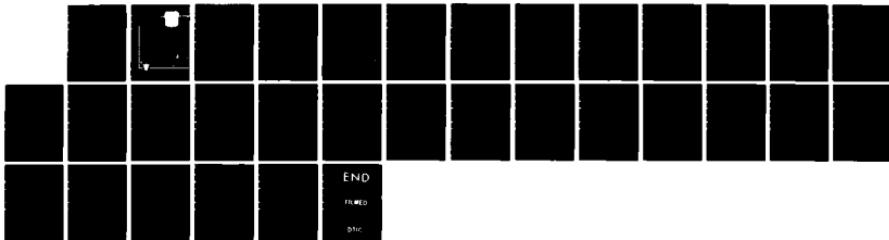


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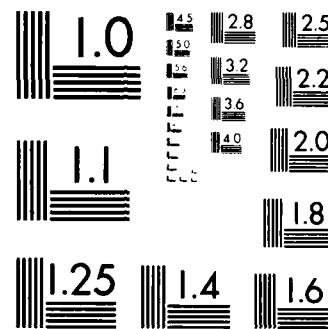
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FIRE SUPPORT FOR A MODERNIZED BRIGADE

BY

LIEUTENANT COLONEL THOMAS W. KARR, FA

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1. REPORT NUMBER	2. GOVT ACCESSION NO.	3. RECIPIENT'S CATALOG NUMBER
		AD-A157 012
4. TITLE (and Subtitle)	5. TYPE OF REPORT & PERIOD COVERED	
Fire Support for a Modernized Brigade	STUDENT PAPER	
7. AUTHOR(s)	6. PERFORMING ORG. REPORT NUMBER	
Lieutenant Colonel Thomas W. Karr		
9. PERFORMING ORGANIZATION NAME AND ADDRESS	10. PROGRAM ELEMENT, PROJECT, TASK AREA & WORK UNIT NUMBERS	
US Army War College Carlisle Barracks, PA 17013		
11. CONTROLLING OFFICE NAME AND ADDRESS	12. REPORT DATE	
US Army War College Carlisle Barracks, PA 17013	19 April 1985	
14. MONITORING AGENCY NAME & ADDRESS (if different from Controlling Office)	13. NUMBER OF PAGES	
	28	
16. DISTRIBUTION STATEMENT (of this Report)	15. SECURITY CLASS. (of this report)	
Approved for public release; distribution is unlimited.	Unclassified	
17. DISTRIBUTION STATEMENT (of the abstract entered in Block 20, if different from Report)		
18. SUPPLEMENTARY NOTES		
19. KEY WORDS (Continue on reverse side if necessary and identify by block number)		
20. ABSTRACT (Continue on reverse side if necessary and identify by block number)		
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USAWC MILITARY STUDIES PROGRAM PAPER

FIRE SUPPORT FOR A MODERNIZED BRIGADE

AN INDIVIDUAL STUDY PROJECT

BY

Lieutenant Colonel Thomas J. Karr, FA

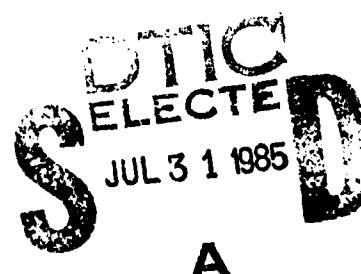
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Carlisle Barracks, Pennsylvania 17013

19 April 1985



ABSTRACT

AUTHOR: Thomas W. Karr, LTC, FA
TITLE: Fire Support for a Modernized Brigade
FORMAT: Individual Study Project
DATE: 19 April 1985 PAGES: 25 CLASSIFICATION: Unclassified

The modernization of US Army forces has progressed rapidly in all areas over the past few years. New equipment is more sophisticated and more capable. Often new equipment is fielded without doctrine to support its employment, and doctrine is either derived, or as a minimum modified, based on experience in the field. Field artillery forces are being modernized at the same time the armor and infantry forces with whom they fight are acquiring new equipment. The addition of the M1 Abrams tank, the M2 Bradley Infantry Fighting Vehicle and the M3 Cavalry Fighting Vehicle has given the maneuver units the ability to move great distances very rapidly and the ability to strike objectives deep in the enemy rear. The field artillery, so critical to developing total combat power, has not experienced a comparable mobility improvement. Thus, insuring the availability of critical fire support has become more difficult. This subject needs to be considered by the leadership of the US Army, and by the field artillery community in particular, to see that this deficiency does not continue. I feel it imperative to add that there are some who contend that the mobility differential problem will be nonexistent in war because, according to them, if maneuver units are moving fast enough to outrun their artillery, then obviously resistance is so light, field artillery is not required.

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A1



CHAPTER I

COMBAT POWER AND FIRE SUPPORT

The importance of firepower as an integral part of total combat power is well known and accepted. US Army doctrine is replete with references to firepower and its significance in developing combat power. For example, according to FM 6-20, combat power equals maneuver plus firepower. A major portion of firepower is indirect fire support, and the great majority of indirect fire support is field artillery. Hence, one can conclude that field artillery support is a major element of combat power. With the introduction into the force of the M1 Abrams tank, the M2 Bradley Infantry Fighting Vehicle (IFV), the M3 Cavalry Fighting Vehicle (CFV) and other modernization efforts, providing this critical fire support has taken on some new challenges. The battlefield will no longer be the same because of the speed of the M1, M2 and M3. (From this point on references to the M2 apply equally to the M3.) Fire Support Team (FIST) vehicles, most of which are currently M113s cannot operate at the speed of the M1 and M2 and consequently the FIST is frequently out of position and unable to properly perform his fire support functions. Maneuver battalion ARTEP evaluations in 1983 in the 3d Mechanized Infantry Division highlighted as a real problem the inability of the FIST chief to keep up.¹ Major units which have expressed a concern about FIST mobility include the 1st Armor Division, 2nd Armor Division, 3d Mechanized Infantry Division, 5th Mecha-

nized Infantry Division and the III Corps.² Shown at appendix 1 are some of the comments of general officers relative to this problem. Furthermore, the FIST M113, which always presented a unique signature because of the four antennae, now presents an even more unique signature because it is one of the only M113s to be found on the battlefield with mechanized and armor forces. On exercises at the National Training Center the FIST vehicle was "killed" very early in force on force exercises because of the FIST vehicle's unique signature.³ The direct support artillery for mechanized and armor units, the M109 howitzer battalion, suffers from a significant speed differential in comparison to the M1 and M2 equipped forces. Furthermore, with the addition of TACFIRE and BCS to the field artillery battalions, these battalions have become more sophisticated and more capable, but they have suffered a degradation in mobility because of the increased displacement times. Furthermore, FIST Force Development Testing and Experimentation II (FIST FDTE II), using modernized equipment, revealed that digital communications suffered in high speed environments and that FIST had to slow down or go to voice communications.⁴ Field Manual 100-5, in discussing firepower, states that firepower must have the "tactical mobility necessary to place weapons within range of critical targets..." Exercises at the National Training Center have shown examples where field artillery units were out of range to support fast moving M1 and M2 equipped forces.⁵ Other examples of this include the Reforger exercises of 1982, 1983 and 1984. On other occasions the field artillery units were on the road trying to catch up with these rapid moving M1 and M2 forces, or attempting to get into position where they

could provide the needed fire support. As a result of the high speeds of these maneuver units and the ability to employ them deeply in accordance with current doctrine, a large percentage of the targets requiring attack by field artillery may be long range fires because of the inability of the field artillery to maintain proper positioning. This presents the field artilleryman with an ammunition management problem because only a portion of his ammunition can be fired at these long ranges. Because the FIST is operating in one of the few M113s within the maneuver force, maintenance of this vehicle is another challenge to be overcome. With the exceptions of the maintenance and the signature problems of the FIST in an M113, all of the other problems result from the mobility differential between the M1 and M2 and the current inventory of field artillery equipment. Field artillery doctrine is extremely clear concerning the mobility of fire support assets. "On the Airland Battlefield, fire support must be as mobile as the supported force. To ensure fire support mobility, fire support officers (FSO) must coordinate closely with supported commanders to make sure that fire support assets are always available to provide close and continuous support. When a brigade or task force maneuvers against the enemy, fire support moves in depth and laterally across the zone... Still, a unit must be mobile enough to reposition forward in support of an attack or laterally and in depth to defeat a threat or penetration anywhere in the zone of the supported or adjacent force. Mobility is critical to preserve the integrity of our combined arms team."⁶ And, according to other doctrinal guidance discussing speed, artillery has to have enough mobility to keep up with the action in the area of the supported force.⁷

THE PROBLEM

The importance of mobility in providing adequate fire support and the importance of fire support to combat power is clearly stated and cannot be overlooked. Despite all the references to mobility in doctrine, there appears to have been little emphasis by the field artillery community on mobility for the current inventory of equipment. In fact, it is only very recently that any real concern with mobility has been shown. According to an article in Army magazine the widely acclaimed fire support mission area analysis identified problems with communications, target acquisition, poor delivery system performance and limited lethality of ammunition.⁸ Mobility was not identified as a major issue. The article goes on to discuss how the field artillery will focus on providing decision makers with deeper target acquisition capability. This will only exacerbate the mobility problem and the long range fires needed. In a similar manner, a recent article in Military Review describes the field artillery of today and the future. The article repeatedly talks about the ability of field artillery to attack deep targets. In fact it defines deep targets for today as "20 kilometers beyond the front line of troops," and for tomorrow deep targets will be even at greater ranges.⁹ Hence, the problem: Accomplishing the "mobility" required with the current inventory of equipment and solving the attendant problems stemming from the mobility differential.

CHAPTER II

DISCUSSION

The subjects discussed above highlight some real problems which must be dealt with immediately if adequate fire support is to be provided. The issues warranting examination in greater detail fall into one of two areas: FIST vehicle or firing elements.

FIST VEHICLE

The speed and signature of the M113 have made the job of the FIST chief working with M1 and M2 equipped units an extremely difficult task. As mentioned earlier, the FIST chief runs the very high risk of being outrun and finding himself out of position. On the other hand, when able to keep up with the maneuver unit formations, because of his signature, he has a high probability of being identified and neutralized by the enemy. Close Support Study Group III (CSSG III), a TRADOC chartered study conducted by the Field Artillery School completed in late 1984, has concluded that the FIST needs to be equipped with an M2 Bradley variant in order to properly perform his duties (this pertains only to those FIST elements with mechanized infantry, armor and cavalry units). Because of the current unavailability of the FIST variant of the Bradley, the study recommended, and it is the Field Artillery School's position, to purchase FISTV (FIST vehicle) M981s as an interim solution until a Bradley variant is available.¹⁰ The M981 was originally planned to replace the M113 for all FIST elements. This M981 FISTV is an M113 family vehicle, and although it remains slower than mod-

ernized heavy forces and also still has a unique signature, it does have several features which make it more advantageous than the M113 currently being used by the FIST. Other considerations, some of which have been tried in units both in CONUS and Germany, include putting the FIST chief in the M2 IFV or the M1 tank.¹¹ Doing this essentially eliminated the problems of signature and mobility differential. Furthermore , when the FIST chief was in the Bradley or Abrams of the company commander, the coordination with the maneuver commander by the FIST chief was certainly facilitated. The major disadvantage found to these options were communications deficiencies for the FIST chief, the fact that the FIST chief also had to act as a crew member, the degradation to the company commander's flexibility to command and control because he was tied to the FIST chief and vice versa. The communications deficiencies centered around the insufficient number of radios for both the company commander and the FIST chief based upon their individual requirements. Some units rigged specialized radio mounts to accommodate the FIST chief's needs, but these local fixes were only partially satisfactory. The major problem with having the FIST chief in the M1 or M2 was that the FIST chief could not perform as a crew member and FIST chief simultaneously. This was especially true when the vehicle was involved in actual fighting. In the tank the FIST chief served as the loader. If he were to perform fire support functions then the tank could not be properly fought and most maneuver commanders felt that they could not afford to give up the capability of the tank. In the Bradley the FIST chief performed gunner duties. In this case, if the Bradley was actually engaged in fighting, the track commander could use

CHAPTER IV

CONCLUSIONS AND RECOMMENDATIONS

Although the difficulties in providing the requisite fire support to these fast-moving M1 and M2 equipped forces has been experienced throughout the Army, there are solutions to these problems, some of which have been discussed in the paper. These solutions have come about because of the actions of leaders in the field discovering innovative ways to accomplish the mission with the resources available. However, even with these innovative solutions, providing adequate fire support is difficult at best, and will not always be possible given existing circumstances. Some actions at higher levels are needed. One decision which has been made since the inception of this study has been the selection of a Bradley variant for the FIST in armor, mechanized infantry and cavalry forces. This decision will solve most of the FIST problems. There are still many other actions needed. One is the reorganization to the 3 x 6 configuration as soon as possible in order to give the field artillery battalion commanders greater flexibility and freedom of action for positioning his firing elements. Another is to take appropriate action to increase the range of cannon artillery. Also needed is more frequent application of decentralized command and control. Of paramount importance are decisions which will cause field artillery units to acquire mobility comparable to that of the supported maneuver units. Finally, maneuver commanders must be impressed with the fact that these problems

will facilitate repositioning more quickly when the situation dictates. Along these lines, use of dedicated batteries might prove beneficial, especially with eight gun batteries. Dedicated batteries is decentralization to the maximum and allows the most responsive artillery possible.

may, in fact, be in better position to support the action than if they were inside the boundaries of the supported maneuver force. The coordinating of fires across boundaries is easily accomplished. Also, having the field artillery units in another area may even give the maneuver forces more maneuver flexibility and freedom of action. Furthermore, in airland battle where there is emphasis on lateral movement by maneuver forces, the field artillery positioned in adjacent sectors may be better located to support the action. In order to take advantage of other artillery within supporting range, fire support sections at higher headquarters need to be involved. Corps Artillery may play a major role in this. Their units may be critical to providing continuous fire support across the extended battlefield of the airland battle. Careful positioning of these Corps Artillery assets and proper assignment of the tactical missions for them could well determine whether the necessary field artillery is in the proper position when needed to complement the fires of the direct support or reinforcing field artillery. Consideration by Corps Artillery as to the employment of Lance with a range of sixty kilometers could be very important. This weapon system can be extremely effective against deep and lucrative targets. It might be advisable to decentralize control in field artillery organizations as much as possible. This will allow them to react more quickly and to be more responsive to the fire support requirements of the maneuver force. Decentralization, for example, will permit the establishment of responsive fire request channels and procedures. Moreover, decentralization

this is an old principle, it has never been more complex or important. Fire support officers who know what the maneuver commander is planning can insure that the supporting artillery is informed so that they can take any preparatory actions which enable them to better react and be at the right place at the right time. Additionally, when the fire support officer foresees problems in providing the requisite fire support from the supporting artillery because of range limitations or excessive movement requirements, he can coordinate with other artillery in the area that might be able to provide additional supporting fires and bolster the fires of the assigned direct support artillery. Along the same lines, the fire support officer can coordinate the use of attack helicopters and close air support to cover those areas which surface fires cannot adequately engage. Finally, if there simply is no way to provide the desired fire support, the fire support officer should so advise the maneuver commander so that he can modify his maneuver scheme, or as a minimum, operate with full knowledge that he is at risk because of inadequate fire support.

As was mentioned earlier, field artillery firing units can be pre-positioned so as to be in position to better support maneuver forces. It may be necessary to pre-position in less secure areas and it may even be necessary to provide security forces for the field artillery units. The risk involved may be warranted depending upon the importance of the operation, the degree of risk involved and other means of fire support available. Pre-positioning in areas outside of the maneuver unit boundaries may be advisable on a battlefield with non-linear characteristics. By doing this, field artillery units

will have a reinforcing or general support reinforcing battalion available to provide additional fires. However, even the general support and general support reinforcing artillery do not always possess the range capability desired. See appendix 2 for range capabilities. Again, by careful planning and coordination the movement and positioning of firing units can allow them to help attack long range targets. It is important to note at this point, however, that with the increased emphasis on the rear battle and availability of field artillery to support it, there may be less other field artillery available for the direct support artillery to call for assistance. Finally, the proper use of the other artillery that may be in range can offer the same advantages. All artillery in range should be considered for use, regardless of its tactical mission. With the addition of the longer ranges and increased firepower available with the Multiple Launch Rocket System (MLRS), we now have a weapon to supplement the direct support artillery better than the eight inch howitzer general support system. The MLRS can achieve a range in excess of thirty kilometers, whereas the eight inch howitzer has a range comparable to the 155mm direct support artillery. With the MLRS, a single launcher firing its pod of twelve rockets (nine launchers per battery) can cover an area of six football fields with nearly eight thousand submunitions in less than a minute. A terminally guided warhead, as well as anti-armor mine warheads, are currently under development for the MLRS. Perhaps one of the most significant actions that can be taken and insure that field artillery is continually able to provide support, is the proper coordination by fire support officers at battalion, brigade and division levels. Although

of ammunition which may be needed for more lucrative long range targets later. When both white and green bag propellant can be used, the selection of green bag (shorter maximum range) propellant must take priority in order to save white bag propellant for longer range targets. Both of these actions will increase the availability of those ammunition resources needed for critical long range targets. Another consideration is to more effectively use close air support and attack helicopters. The addition of the combat aviation brigade should provide some significant help in this area. Also, consideration should be given to using longer range rocket and missile systems. Better positioning of firing elements can also reduce the long range requirements. When field artillery battalions transition to the 3 X 8 concept (three batteries of eight guns each) field artillery battalion commanders will have basically six firing elements to position rather than the three under the current six gun battery organization. An eight gun battery will have the capability of functioning with two firing elements of four guns each. These elements may be separated by several kilometers. Hence, with six firing elements, the field artillery battalion commander will have greater movement and positioning flexibility, and with proper planning should be able to better position and move his firing elements to preclude firing a preponderance of long range fires, regardless of the speed of the maneuver elements. Another way in which the field artilleryman can reduce the out of range or long range target problem is through proper coordination with other available field artillery assets. In most cases the direct support artillery battalion

the FIST chief is in his M113 and will have to be considered when the FIST chief is ultimately in the Bradley variant. Furthermore, this has been dealt with ever since the inception of the FIST concept. The only other disadvantage to this is that the Bradley may not be optimally positioned as a fighter in order that it be positioned to allow the FIST chief to most effectively perform his fire support duties. The worst case is that it reduces the combat capability of the company by one Bradley. After consideration of all aspects, putting the FIST chief in a Bradley other than the company commander's vehicle is the best solution. Leaving the FIST chief in the M113 in an infantry battalion has too many inherent disadvantages which have already been discussed.

FIRING ELEMENTS

Although the decision has been made to upgrade the mobility of the FIST, there has been little done concerning the mobility of the remainder of the fire support package. Consequently, the problems of keeping firing elements within range, and long range fires with the concomitant need to properly manage ammunition, do not disappear with the arrival of the Bradley variant FISTV. These issues need to be addressed now as well as in the future. In the case of long range fires and the resulting ammunition management problems, there are several actions which can be taken. The proper target selection and the careful selection of ammunition for the attack of the target are very important. To fire on long range targets when the probability of achieving the desired results is low will result in the expenditure

functioning as FIST chiefs when available.

In the case of the Bradley battalion, the FIST chief can best perform his duties in a Bradley. The FIST chief could be positioned either in the company commander's vehicle or in another Bradley to be selected by the company commander. Consider first, the option of putting the FIST chief in the company commander's Bradley. The fighting contribution of a single Bradley to the infantry company is not as significant or critical as that of an M1 to the tank company. In usual situations, the FIST chief has the opportunity to perform his fire support functions rather than the duties of a crew member (a gunner in a Bradley). However, when the company commander's vehicle is engaged in direct fighting, the company commander can use his override capability and fight the vehicle himself rather than require the FIST chief to do so. This technique allows the FIST chief to perform fire support functions. It should be noted that operating in this manner will cause the company commander to fight his vehicle at the expense of exercising command and control over his company and this trade off needs to be taken into consideration. There are some maneuver commanders who are not going to accept this degradation to their command and control. In these cases, another possibility is to put the FIST chief in a Bradley other than the company commander's. This solution still eliminates the mobility differential, signature and maintenance problems. The major drawback to this is that it separates the FIST chief from the company commander. However, this is not a really insurmountable problem and, in fact, is something that must be dealt with if

should remain in his assigned M113 until such time as the M981 is available, and eventually the Bradley variant. (As an aside, the Bradley variant will still provide somewhat of a signature within a tank battalion formation, but that will be minimized when task forces of armor and infantry are used.) There are some actions that can be taken to minimize the shortcomings associated with the use of the M113 for the FIST chief. In the area of maintenance, provisions need to be made to insure availability of parts and maintenance personnel with M113 experience. This should not be that difficult for the next few years. In order to offset the mobility differential, the company commander and the FIST chief need to be especially sensitive to this problem and take whatever actions they can to alleviate the problem. Some actions that may prove quite successful are: (1) keeping the FIST chief well informed as to the tactical situation and plans, so that he can anticipate and be active initially - this is necessary for proper fire support coordination anyway (it is unacceptable that as has happened on some occasions the FIST chief was forgotten when the maneuver commander briefed leaders on movement plans); (2) pre-positioning the FIST vehicle along the route of movement if time and the situation permit; (3) putting the FIST chief vehicle in the front of the formation initially when the situation allows; (4) moving the FIST chief with the company commander in his vehicle (and allowing him to use one of the radios on a temporary basis or to carry his own pack mounted radio gear) on a fast moving situation and letting the remainder of the FIST bring the M113 forward and allow the FIST chief to move to the M113 when it is in position; and (5) augmenting the FIST with Combat Observation Lasing Teams (COLT) and airborne observers

become available, the problems of the mobility differential, signature and maintenance will disappear. In the meantime, the M981 FISTV appears to be the most attractive option. Until such time as FIST chiefs are issued the M981s, there appear to be two solutions to the problem which are being used with varying degrees of success throughout the Army.¹⁴ The first is to do the best possible with the M113. The second is to put the FIST chief in either an M1 or an M2 and to eliminate the problems of mobility, signature and maintenance, and to accept the degradation of his ability to perform fire support duties when required to perform as a vehicle crew member. My own choice, based on personal experience and on the experiences of several other previous battalion commanders (both field artillery and maneuver), is to use a combination of the two options.

In the case of an M1 tank battalion, the evidence supports leaving the FIST chief in his M113. As a member of an M1 tank crew his crew duties, visibility from the tank and available communications will too severely degrade his fire support functions. Moreover, if his presence in the tank causes the maneuver commander to keep that tank out of the fight, that will degrade the capability of the tank company too severely, especially with the numerical superiority of tanks the US Army expects to face in potential adversaries. The fire support to be gained by allowing the FIST chief to devote all, or most of his time to fire support functions, will probably not be that great anyway. This inadequate fire support would be a result of the difficulty of the FIST chief to properly perform his duties in an M1 tank, as mentioned earlier, because of limited visibility and communications. Therefore, the M1 tank battalion FIST chief

CHAPTER III

PRACTICAL SOLUTIONS

The problems discussed create some significant issues for which solutions must be provided if maneuver units are to be assured of adequate fire support. There are some practical solutions which are being used now.

FIST VEHICLE

When I began this study effort, the Army was planning to acquire M981 FISTVs for the FIST in armor, mechanized and cavalry organizations. The M981 is a specially designed vehicle providing the FIST chief with several "packages" to better perform his fire support duties compared to the equipment he now has in his M113. The FISTV however, as mentioned earlier, is of the M113 family and, as such, the problems of mobility differential, signature and maintenance previously discussed, would be present. However, in the last few months, as a result of FIST FTDE II, and, I believe, comments from the field, as well as CSSG III, the Field Artillery School and TRADOC commander have decided that a variant of the Bradley IFV is necessary for the FIST vehicle used in mechanized, armor and cavalry forces. Actions have been undertaken to procur these vehicles.¹³ However, it will be some time before the vehicles are available and issue can be made. In the interim, the Field Artillery School is proceeding with the acquisition of the M981 vehicles. These vehicles will give the FIST an improved capability until the Bradley variants become available. When the variants do

assisted projectiles (RAP). The range achieved with standard projectiles using charge 8 is eighteen kilometers, and using charge 7 only fifteen kilometers. Using green bag propellant (a maximum of charge 5) the maximum range is less than ten kilometers. It is significant that a basic load of ammunition which is available to a field artillery battalion has a mixture of ammunitions, to include propellants. Within a type basic load one will find some RAP, some charge 8, some white bag propellant and some green bag propellant. In other words, every round cannot be fired using longer range propellants, nor are there sufficient amounts of RAP and charge 8 to fire without constraint. It also means, that in some cases only targets of lesser ranges are all that can, or even should, be taken under fire. All of these longer range targets which we now have the capability to detect will simply have to be prioritized for field artillery attack or attacked by some other means. Unfortunately, recent experience has shown that those field artillery units supporting modernized infantry and armor forces have generally had trouble staying closely behind these forces, and have expended higher percentages of long range fires than previously experienced.¹² The ammunition management challenge to insure the availability of the proper types of ammunition at the critical time is significant indeed.

force. Several factors have contributed to this. First, and most obvious, is the speed of the modern maneuver units. Second, doctrine and training experience have taught field artillery commanders when to move and where to position their howitzers relative to the battlefield situation and known plans. These proven field practices and learned techniques are not necessarily correct anymore because of the greater rate of advance capability of the maneuver forces and the method in which these fast moving forces are employed. There are increased tendencies of maneuver commanders to employ these forces against deeper objectives or to move them greater distances to strike enemy penetrations. Consequently, their supporting field artillery is not always in position, simply because it can not move those great distances fast enough. The maneuver commander's desire to take advantage of the great mobility now possessed by his unit has put at risk the provision of adequate force support by the field artillery.

The problem of long range fires and ammunition management are logical consequences of the howitzer units being outrun by the maneuver forces. This speed differential has made it extremely difficult for the field artillery units to be positioned closely behind the maneuver forces. This, combined with the more recent emphasis on the attack of targets affecting follow on forces, and counterfire targets, means that a large amount of field artillery fires are going to be long range fires. Although the M109A2 and M109A3 howitzers (those normally found in direct support of M1 and M2 units) have a range of twenty three kilometers, it is important to note that this is a maximum range and is achievable only with rocket

his override capability and fight the vehicle. This allows the FIST chief to perform his fire support duties while the vehicle is engaged in fighting. However, if the track commander were the company commander, the objection was that he should not be tied down fighting the vehicle because it too seriously degraded his ability to command and control his company. Finally, in both the M1 and M2, if the vehicle were in a good fighting position, then it quite likely was not in the most advantageous position for the FIST chief to perform his duties, and vice versa.

The next problem to be discussed is that of maintenance for the FIST vehicle. On a battlefield where infantry and armor have the M1 and M2 the M113 or FISTV M981 will be one of the few M113 family vehicles which must be supported and maintained by the maneuver unit. Furthermore, the FIST vehicles, like some of the other M113 family vehicles to be found with the maneuver units (e.g. engineers), are not organic to the maneuver unit. Consequently, repair parts will be a serious problem. Furthermore, trained mechanics to work on these vehicles may indeed be a rare commodity.

FIRING ELEMENTS

Field artillery units which allow themselves to get out of range to support maneuver units are considered to have committed one of the "unforgivable sins" of the field artillery. Yet, with the arrival of the M1 and M2 in maneuver units, it has become much more common for field artillery units to find themselves on the road trying to close the distance between themselves and the maneuver units or discovering that they are totally out of position to provide fire support to the maneuver

exist and that commanders' failures to consider these problems in their planning could lead to disaster. Without these actions, providing proper fire support and insuring development of the necessary combat power to win the battle may not be possible.

ENDNOTES

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APPENDIX 1

COMMANDER QUOTES

"To provide the FIST the ability to effect command and control well forward in the battle area each element must have the same mobility as the maneuver force."

LG Dale A. Vesser

"This Division has experimented with various alternatives... we need the FISTV mounted on the M2 chassis."

LG Howard S. Crowell Jr.

"The fielding of the M1, M2, and M3 will further exacerbate the existing mobility differential."

LG Crosbie E. Saint

"I feel strongly that the ability of the FIST to 'keep up' with the task force will play a very decisive role in our airland battle doctrine. The ability to 'keep up' can influence an engagement in such a way as to determine victory or defeat."

LTG R. L. Netzel

APPENDIX 2

RANGE CAPABILITIES

SYSTEM	MAXIMUM RANGE	
	a. With RAP	b. Without RAP
105mm, M101A1	a. 14,500 b. 11,600	
105mm, M102	a. 15,100 b. 12,400	
105mm, M119	a. 19,500 b. 14,300	
155mm, M114	a. 19,300 b. 14,600	
155mm, M103	a. 30,000 b. 22,400	
155mm, M109	a. 23,500 b. 18,100	
8 inch, M110	a. 30,000 b. 22,900	
M113	a. 30,000 b. NA	
Lance	a. 65,000 b. NA	

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